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Insomnia in Patients with Chronic Pain

:: Abstract Theme: Sleep and pain

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Purpose: This study investigates the prevalence of insomnia and its relationship to other symptoms and health aspect in patients with chronic pain referred. **Methods:** Patients with chronic pain conditions (n=845) referred to a multidisciplinary pain centre completed well-known and validated questionnaires covering aspects of symptoms, participation, and health. In addition, these patients completed the Insomnia Severity Index (ISI). **Results:** The majority of patients (65.3%) had clinical insomnia according to the ISI. Insomnia correlated significantly but weakly with pain, depression, anxiety, and coping; the strongest multivariate correlations were found with depression and anxiety followed by pain interference and pain severity. When considering the importance of insomnia and other common symptoms in chronic pain for two aspects of health, the importance of insomnia was limited. **Conclusions:** The prevalence of insomnia is high in patients with chronic pain conditions but the level of importance for health aspects is low, and the associations with other important parameters/symptoms are relatively weak. One way to increase the effects of multimodal rehabilitation program designed for patients with chronic pain may be to include interventions directed directly towards insomnia and not only assume the positive indirect effects of interventions directed towards pain, depression, and anxiety.

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Introduction: Recently, snoring, independent of sleep apnea has been reported to have serious health consequences including carotid atherosclerosis. Detection of snoring is currently dependent on limited, poorly defined methods both for registration and analysis. Our study aims to add knowledge on how to measure and analyze snoring for future studies relating snoring to important health outcomes. **Methods:** Snorers were assessed with full in-laboratory polysomnography (Embla A10, Natus Medical Inc). Snoring was assessed with two overhead microphones, one chest microphone (T3 device, NoxMedical), a piezoelectric vibration sensor and an accelerometer on the neck and vibration in the nasal cannula. **Results:** Our preliminary findings of n=8 snorers showed a high correlation between the measured noise level of the chest microphone and the average dB of the two overhead microphones with the majority of events within 3dB of each other. The fundamental frequency of snore events was measured from 50-250 Hz by sound analysis. However the three vibration sensors (piezoelectric, accelerometer and cannula) could only measure a range from 0-100 Hz. Therefore they could not pick up all snore events. The cannula additionally had a high noise floor, allowing it to be maximally 67% sensitive to snore events. The piezoelectric sensor was more sensitive to postural effects than the accelerometer and showed a significant increase in measured power when the subject lay on the same side as the sensor was positioned. **Discussion:** Sound measurement of snoring is the most accurate objective analysis of snoring. Both cannula and neck vibration assessments of snoring have issues, causing them to miss out on a portion of snore events.

Assessment of Different Snore Measurements

:: Abstract Theme: Sleep disordered breathing – new challenges

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Neurobiology and sleep disorders in Cluster Headache

:: Abstract Theme: Sleep and pain

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Cluster headache (CH) is a severe chronobiological pain-condition with recurring attacks of high-intensity headache accompanied by autonomic symptoms and agitation. Many attacks occur at night which may directly disrupt sleep but even patients who do not have nightly attacks complain of daytime sleepiness and poor sleep quality as do those who are not in the active disease period. A direct effect on sleep is obvious when attacks occur during the night but how daytime attacks affect sleep is not understood. There is a direct anatomical overlap of regions involved in the pathogenesis of headache and those involved in the regulation of sleep. The aim of the this ongoing research project is to investigate how headache and sleep interact in this particular headache disorder.

Quality of life and sleep apnea - Effect of treatment

:: Abstract Theme: Sleep disordered breathing – new challenges

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The aim of this study was to compare health-related quality of life between patients with obstructive sleep apnea (OSA) and subjects from the general population. In addition, the change in quality of life with PAP treatment was explored. The OSA subjects (n=822) were untreated newly diagnosed with moderate or severe OSA (665 males, 157 females). The controls (n=742) were randomly selected Icelanders who participated in

another epidemiological study (www.boldcopd.org). Quality of life was measured by the Short Form 12 (SF-12) which gives a physical component score (PCS) and mental component score (MCS). Scoring are transformed into a scale ranging from 0 (worst possible health) to 100 (best possible health). The change with PAP treatment was assessed after two years and 90.1% (n=741) of the OSA subjects finished the follow up. Untreated OSA patients reported worse quality of life than subjects from the general population (mean PCS 40.1 ± 10.9 vs. 50.7 ± 8.0 for controls ($p < 0.0001$) and mean MCS 48.4 ± 10.9 vs. 51.4 ± 4.7 for controls ($p < 0.0001$). Among OSA patients, both mental and physical health improved from baseline to follow up (mean change for PCS = 2.57 ± 9.4 and for MCS = 2.37 ± 11.12). The improvement for PAP users was however not significantly greater than for non-users. Untreated OSA patients report severely impaired quality of life and even though both physical and mental health improve from baseline to follow up the improvement is not greater for those being treated with PAP.

Symptoms of insomnia among OSA patients before and after 2 years of PAP treatment

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Objective: The aim of this study was to assess the changes of insomnia symptoms among patients with obstructive sleep apnea (OSA) from starting treatment with positive airway pressure (PAP) to a two-year follow-up. 705 adults with OSA were assessed prior to and two years after starting PAP treatment. All subjects underwent a medical examination, type 3 sleep study and answered questionnaires on health and sleep before and 2 years after starting PAP treatment. The change in prevalence of insomnia by subtype was assessed by questionnaire and compared between individuals who were using or not using PAP at follow-up. **Results:** Symptoms of middle insomnia

were most common at baseline and improved significantly among subjects using PAP (from 59.4% to 30.7%, $p < 0.001$). Symptoms of initial insomnia tended to persist, regardless of PAP treatment and symptoms of late insomnia were more likely to improve among subjects not using PAP. Subjects with initial and late insomnia at baseline were less likely to adhere with PAP (odds ratio (OR) 0.56, $p = 0.007$, and OR 0.53, $p < 0.001$, respectively). Conclusion: PAP treatment significantly reduced symptoms of middle insomnia. Symptoms of initial and late insomnia, however, tended to persist regardless of PAP treatment and had a negative effect on adherence. Targeted treatment for insomnia may be beneficial for patients with OSA comorbid with insomnia and has the potential to positively affect adherence to PAP.

Insomnia – with focus on treatment options

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Chronic insomnia is a prevalent disorder affecting about 10% of the adult population. Insomnia is considered to be the most common sleep disorder. Cognitive behavioural therapy for insomnia (CBTi) is considered the treatment of choice for chronic insomnia, independent of the cause of the disorder. CBTi consists of different treatment components, i.e. stimulus control, sleep restriction, sleep hygiene, cognitive techniques, and relaxation. I will in this symposium describe the principles behind CBTi, and present data from randomized controlled trials. The objections to CBTi are that such treatment is too complicated, too time consuming and not easily available for the patients. Few therapists offer such treatment in the Nordic countries. Thus, there is a need for easily accessible, low-threshold treatment options. There are studies that have examined how the therapy can be made easier and more available. CBTi may be provided by specially trained nurses, using telephone consultations, self-helps books, or through treatment via the internet. I will present results from such kind of treatment options. The

studies indicate that these self-help strategies may be efficient as low-threshold interventions. That is important considering the high number of patients, and the lack of available behavioural sleep specialists for treating this patient group.

Sleep disturbances in intensive care unit

:: Abstract Theme: Sleep in the intensive care unit

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Background: sleep disturbances in the intensive care unit (ICU) seem to lead to development of delirium, prolonged ICU stay, and increased mortality. That is why sufficient sleep is important for good outcome and recovery in critically ill patients. Purpose and methods: the purpose of this study is to summarise different aspects of sleep-awake disturbances, causes and handling methods in critically ill patients by reviewing the existing literature. The selected papers are evaluated according to a 5 - class evidence scale developed for this purpose because of the absence of studies fulfilling normal criteria for evidence. Results: a variety of small studies reveal pathological sleep patterns in critically ill patients including abnormal circadian rhythm, high arousal and awakening index, reduced Slow Wave Sleep, and Rapid Eye Movement sleep. Poor sleep quality in these patients seems to be multifactorial and the major reason of sleep disturbances is still unknown. There are no studies of level 1 evidence according to standard criteria for evidence proving the positive impact of the tested interventions on the critically ill patients' sleep pattern. Therefore also treatment of such sleep disturbances remains unproven. Conclusion: disturbed sleep in critically ill patients with all the severe consequences remains an unresolved problem and needs further investigation in high-quality studies.

The effect of cataract on circadian photoentrainment

:: Abstract Theme: Normal sleep and aging

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Purpose: Stimulation of intrinsically photosensitive retinal ganglion cells (ipRGC) by blue light is essential for the photoentrainment of circadian rhythm. Various eye diseases may affect this photoentrainment either by affecting the ipRGCs directly or by limiting the amount of blue light transmitted to the retina. Cataract causes the latter, thus potentially impairing photoentrainment. In addition, It has been reported that cataract surgery may improve sleep quality. The aim of the present study was to examine the effect of cataract surgery on the photoentrainment of the circadian rhythm.

Methods: Patients with cataract and no other significant diseases were included. Patients were examined before and 3 weeks after cataract surgery. Stimulation of ipRGC was assessed by blue light pupillometry. Melatonin concentration was measured as a 24 hour concentration profile. The circadian rhythm was assessed by questionnaires and actigraphy. **Results:** After surgery pupil constriction to blue light increases ($P < 0.001$) and melatonin also tends to increase ($P = 0.097$). No change was found in sleeping patterns evaluated by actigraphy and questionnaires. **Conclusions:** An increase in pupil constriction and peak melatonin concentration suggest an enhancement of circadian photoreception but a longer follow-up period should be investigated before we may conclude what the implications on the circadian rhythm are.

OSA and stroke – an important association

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Introduction: Stroke is one of the leading causes of death and disability in the western world. Obstructive sleep apnea (OSA) is the most prevalent type of sleep-disordered breathing (SDB) in the general population and a known risk factor for stroke. In the recent years, OSA has also been identified as an important determinant of the morbidity and mortality after a stroke.

Aim: To highlight OSA as a risk factor in stroke development and delineate the extent of impact SDB has on stroke prognosis. Furthermore, guidelines in stroke management regarding SDB will be touched upon, and relevant mechanisms will be discussed.

Methods: Literature searches on stroke and SDB were performed. Examples were used from our research in the Danish Center for Sleep Medicine and Stroke Unit, Glostrup Hospital.

Results: 4-10 % of the population have moderate to severe OSA. OSA patients have a relative risk of 2 of developing stroke. Both our study and others show SDB prevalences of around 70 % in stroke patients. In patients with minimally symptomatic OSA there seems to be no effect of CPAP on cardiovascular risk. CPAP seems to decrease stroke risk only in patients with severe OSA and decrease the risk of recurrence of stroke in patients with moderate to severe OSA.

Conclusion: Patients with OSA have a much increased stroke risk. Treatment with CPAP seems to decrease their risk, especially in patients with severe disease. SDB is frequent in stroke patients, and treatment is important in order to decrease morbidity and mortality.

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Sleep disturbances in schizophrenia

:: Abstract Theme: Psychiatric sleep disorders

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Several studies of schizophrenia patients demonstrate disturbances in sleep continuity (reduced sleep efficiency and total sleep time, increased sleep latency), disturbances in sleep architecture (alterations of stage 2 sleep, slow wave sleep, and rapid eye movement (REM) sleep variables), and disrupted circadian rhythmicity. Insomnia constitutes an important part of the dysfunctional sleep pattern in schizophrenia. Acute insomnia is associated with the inherent hyperarousal state in psychotic exacerbation, but insomnia often persists in a residual form after otherwise adequate treatment of the psychotic symptoms. These sleep disturbances are based on a complex interaction between the pathological disturbances of neurotransmitter function in schizophrenia and the influence on neurotransmitter systems by antipsychotic drugs. Sleep disturbances are associated with reduced quality of life in schizophrenia patients but current treatment guidelines do not include advice on the best treatment approach. Substituting an otherwise efficient antipsychotic drug-therapy with a more sedating drug carries the risk of psychotic relapse during the switch, and adding another drug carries the disadvantages of polypharmacy including increased rate of side-effects, drug-drug interactions, patient non-compliance and medication errors. The sparse literature on treatment of residual insomnia in schizophrenia is discussed.

Classification of iRBD and PD patients based on eye movements during sleep

:: Abstract Theme: Sleep in neurological disorders

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Patients suffering from the sleep disorder idiopathic rapid-eye-movement sleep behavior disorder (iRBD) have been observed to be in high risk of developing Parkinson's disease (PD). This makes it essential to analyze them in the search for PD biomarkers. This study aims at classifying patients suffering from iRBD or PD based on features reflecting eye movements (EMs) during sleep. A Latent Dirichlet Allocation (LDA) topic model was developed based on features extracted from two electrooculographic (EOG) signals measured as parts in full night polysomnographic (PSG) recordings from ten control subjects. The trained model was tested on ten other control subjects, ten iRBD patients and ten PD patients, obtaining an EM topic mixture diagram for each subject in the test dataset. Three features were extracted from the topic mixture diagrams, reflecting "certainty", "fragmentation" and "stability" in the timely distribution of the EM topics. Using a Naive Bayes (NB) classifier and the features "certainty" and "stability" yielded the best classification result and the subjects were classified with a sensitivity of 95%, a specificity of 80% and an accuracy of 90%. This study demonstrates in a data-driven approach, that iRBD and PD patients may exhibit abnormal form and/or timely distribution of EMs during sleep.

Sleep quality and pain thresholds in subjects with tension type headache and migraine compared to healthy controls

:: Abstract Theme: Sleep and pain

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Background: Sleep can be the way out of and into headache. Is it possible to find “the finger print” of headache in sleep? Furthermore, is there a relation between sleep quality and pain thresholds among patients with tension type headache (TTH) and migraine? **Methods:** A blinded, prospective study with case control design, polysomnography, measurements of pain thresholds (PT), data from headache and sleep diaries and questionnaires. We included 34 healthy controls, 50 migraineurs and 20 patients with TTH. Migraineurs who had their sleep recording more than 48 hours from an attack were classified as interictal while those registered less than 48 hours from an attack were classified as either preictal or postictal. Migraineurs with attack debut time mainly during night or by awakenings was classified as sleep migraine (SM). Migraineurs without a preference for nightly attacks were classified as non-sleep-migraine (NSM). **Results:** Both TTH and NSM patients had more slow wave sleep (SWS), less fast arousals, more daytime tiredness and a tendency to lower PT than healthy controls. These findings are consistent with sleep deprivation. However, sleep diary showed no difference in sleep time between headache patients and healthy controls. Migraineurs registered in the preictal phase had shorter latency to sleep onset than migraineurs registered in the inter-ictal phase. SM patients had slightly increased number of awakenings than controls and less SWS than NSM. **Conclusions:** Reduced arousal level during awake and sleep and a tendency to reduced PT among TTH and NSM patients may be related to a relative sleep deprivation. Except for the SM group, our data indicate that subjects with headache may need more sleep than healthy controls.

Parasomnia and nocturnal epileptic seizures.

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Epilepsy and sleep are related in several ways. Several normal and pathologic sleep phenomena resemble components of epileptic seizures, and even common final pathways have been

suggested. Differentiating between nocturnal seizures and parasomnia is often challenging. This interactive video-EEG session will address these issues.

Sleep and hypoventilation syndromes

Subtitle: Definitions – causes - management

:: Abstract Theme: Sleep disordered breathing – new challenges

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Nocturnal hypoventilation is a common feature of disorders affecting the function of the central respiratory drive mechanisms or the respiratory muscles. These disorders have in common sleep-related hypoventilation with variable amounts of central apnea and a normal or increased awake PaCO₂. Sleep-related hypoventilation is defined as an increase in the PaCO₂ > 10 mm Hg compared to an awake value. Daytime hypoventilation is de-fined as a PaCO₂ > 45 mm Hg. Early in the disease course, some patients only present nocturnal hypoventilation. This lecture does not discuss patients with nocturnal hypoventilation due to lung disease. The hypoventilation syndromes included in the lecture are sleep-related idiopathic alveolar hypoventilation, congenital central alveolar hypoventilation syndrome and sleep-related hypoventilation/hypoxemia due to neuromuscular and chest wall disorders. The lecture will include disease definition and epidemiology, clinical characteristics of the syndromes, pathophysiology, morbidity and mortality associated with them. Lastly, treat-ment modalities will be discussed.

Short rest periods of less than 11 hours between work shifts predict sleep and health problems in nurses at one year follow-up

:: Abstract Theme: Burden of sleep disorders

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Objectives: We investigated whether annual number of shifts separated by less than 11 hours (quick returns) could predict sleep and health problems one year later. **Methods:** 1224 nurses responded to a questionnaire-based survey in 2009 (T1) and 2010 (T2). Crude and adjusted logistic regression analyses were performed to assess the association between annual number of quick returns at T1 and these dichotomous outcome variables at T2: Shift Work Disorder (SWD), excessive sleepiness (ES; Epworth Sleepiness Scale, > 10), pathological fatigue (Chalder Fatigue Scale, summed binary scores > 4) controlling for: age, gender, the outcome variable in question at T1, number of nights at T1, and change in quick returns and night shifts from T1 to T2 (no change \pm 5 days, increased or decreased). Significance was set to $p < 0.05$. **Results:** The following results are based on the adjusted analyses, shown in table 1. The number of quick returns at T1 was related to an increased risk of SWD at T2. A decreased number of quick returns from T1 to T2 was related to a reduced risk of SWD at T2. The number of quick returns at T1 was not associated with ES, however, a decrease in quick returns from T1 to T2 entailed a reduced risk of ES at T2. The number of quick returns at T1 entailed an increased risk of pathological fatigue at T2. Also, a reduction in number of quick returns from T1 to T2 entailed a reduced risk of pathological fatigue at T2. **Conclusion:** The number of quick returns at T1 predicted SWD and pathological fatigue at T2, while a decrease in quick returns from T1 to T2 was associated with reduced risk of SWD, ES and pathological fatigue at T2.

Sleep, Television and Computer Habits of Swedish School-Age Children

:: Abstract Theme: Sleep in pediatrics

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Objective: The aim was to investigate sleep, television and computer habits and enjoyment and feelings of tiredness in school of school-age children and adolescents in Sweden. **Methods:** This cross-sectional study was conducted in a city in southern Sweden. All schoolchildren there aged 6, 7, 10, 14 and 16 were offered an individual health care visit. A questionnaire, the validity and reliability of which had been tested earlier and been found to be satisfactory [1] was distributed to the children ($n=3011$). **Results:** Those sleeping less than the median length of time reported a lower degree of enjoyment of school. Short sleep was found to be associated with having a bedroom TV, spending more than 2 hours a day at the TV or the computer, being tired in school, and having difficulties both in waking up and in sleeping [2]. **Conclusions:** Discussing sleep and media habits with schoolchildren and their parents regarding matters of optimal sleep and of how media habits affect sleep and learning is seen to be an important task. [1]Garmy P, Jakobsson U, Nyberg P (2012) Development and Psychometric Evaluation of a New Instrument for Measuring Sleep Length and Television and Computer Habits in Swedish School-Age Children. *Journal of School Nursing*. April 2012 28: 138-143. [2]Garmy P, Nyberg P, Jakobsson U. (2012) Sleep and Television and Computer Habits of Swedish School-Age Children. *Journal of School Nursing*. 2012 Dec;28(6): 469-76

The hypocretin system and its physiological roles- revisited

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After the initial discovery in 1996 by Gautvik and colleagues (1) and the group's subsequent characterization of the peptides as neuroexcitatory (2), Sakurai and colleagues in the same year 1996, described these peptides as orexins and identified their two receptors linking the function to stimulation of food intake, wakefulness and energy expenditure (3). Two groups in 1999 described narcolepsy in canine caused by a mutation in hypocretin-2 receptor (4) and in mice after hypocretin gene knockout (5). These results combined with a report by Thannickal et al (2000) (6) of reduced number of hypothalamic hypocretin neurons in human narcolepsy, firmly identified this system not only as important, but also necessary for wakefulness. Today, low hypocretin CSF concentrations, but rarely unmeasurable, identifies about 80 % of patients with cataplexy and the degree is inversely related to the CSF peptide concentration (7). Narcolepsy with cataplexy and normal CSF hypocretin, represents apparently another causal mechanism since receptor resistance/ deficiency has not been described in humans. As to the initial description of the "orexis" (Greek: appetite) function in mice, most reports from humans do not favor a primary appetite stimulating effect. Adult patients with narcolepsy tend to have BMI moderately higher than healthy persons, but lower than patients with other types of hypersomnia, and they have normal HbA1C (8). In children, however, a marked weight gain has been demonstrated in several cases, possibly due to a different effect of hypocretin on an immature brain (9). In animals, the hypocretins have been shown to have diverse effects on brain reward and autonomic systems related to focused behaviour, e.g. feeding which requires motivation and alertness. Central administration of hypocretin 1 provokes strongly wakefulness, elevation in body temperature,

initiates locomotion and increases strongly calorie expenditure. In concordance with the hypocretin system being important for arousal in order to initiate and maintain complex behaviours, activation of hypocretin neurons was shown to be strongly linked to preferences and reward (food, drug) seeking (10).

Thus, the hypocretin system appears to represent a hypothalamic centre together with other specialised nuclei, integrating incoming neuronal input and being responsible for local and far reaching neuronal control affecting complex bodily functions with a primary engagement to provide appropriate arousal and wakefulness. As a core in this complex circuitry, the hypocretin neurons respond to diverse transmitter systems such as noradrenergic, serotonergic, histaminergic and cholinergic including peptidergic input such as melanin concentrating hormone (MCH), proopiomelanocortin (POMC), nerve peptide Y (NPY), corticotropin releasing factor (CRF), glucagon-like peptide (GLP), hormones (leptin, ghrelin) and metabolic signals, e.g. glucose.

As in neuronal networks, these signals are temporally different and may act synergistically or antagonistically. The outcome of the afferent influence will determine the state of excitation/ silence of the hypocretin neurons which finally determine cortical excitability.

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RLS in neurodegenerative diseases: An overview

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RLS in neurodegenerative diseases: An overview

Chronic stress, sleep and the protein factory

:: Abstract Theme: Basis of Sleep

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Stress and sleep loss can have lasting impact on the structure and function of brain circuitry on the level of protein synthesis. We investigated for the first time the effect of chronic stress, sleep deprivation and a combination of these (chronic stress + sleep deprivation) on two key translation factors from gene expression to protein synthesis. The translational factors (eukaryotic initiation factor 4E; eIF4E and elongation factor 2; eEF2) are found to be particularly important for cognitive function and synaptic plasticity. Chronic stress impaired the translation factor activity, but only in the frontal cortex. In contrast, sleep deprivation led to a reduced translation activity also in the hippocampus and the gyrus dentatus. In the combination group, sleep deprivation modulated the effects of stress in the frontal cortex. Sleep quality and sleep quantity directly predicted cortical transcriptional mechanisms in non-stressed rats. High sleep quality, more deep SWS and less wakefulness, was associated with increased activity of the cortical mechanisms to form proteins in the brain. Chronic stress reduced both sleep quality (i.e. depth of sleep) and quantity (i.e. fragmentation of sleep, time in wakefulness), and abolished the association with

sleep and translation factor activity. Sleep quality prior to sleep deprivation also predicted translation factor activity in non-stressed rats. Again, in chronic stressed rats, there was no such association present. The findings has an important impact on the understanding of sleep changes and brain function in stress-induced depression in humans, and the mechanisms of acute sleep deprivation antidepressant effect in these patients, which is described in frontal brain regions.

Lack of circadian variation and reduction of heart rate variability in women with breast cancer undergoing lumpectomy

Subtitle: Decreased heart rate variability after lumpectomy

:: Abstract Theme: Sleep and pain

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Background: Changes in the autonomic nervous system with increased sympathetic tone may be a cause of postoperative short-, and long-term cardiovascular complications. Heart rate variability (HRV) is assessed by Holter-monitoring as a measure of autonomic tone and has not been investigated in patients with breast cancer undergoing surgery. We aimed to investigate evening- and night-time HRV after lumpectomy. Methods: Twelve patients were included in this descriptive study. HRV was measured the night before surgery (PREOP), the night after surgery (PO1) and 14 days after surgery (PO14) from 1900h-0700h. For calculation of HRV, time domain parameters (SDNN-standard deviation of all NN intervals around the mean NN for the period of measurement, pNN50-percentage of beats where the change from one beat to the next is more than 50msec, rMSSD-root mean square of successive differences) were used. We analyzed the variation of the overall time period and the circadian variation between evening and night

(sympathetic vs. parasympathetic tonus). **Results:** Mean heart rate increased from PREOP to PO1 ($p < 0.001$) and also increased between PREOP and PO14 ($p < 0.05$). SDNN ($p < 0.001$) and PNN50 ($p < 0.001$) decreased from PREOP to PO1. There was also a significant decrease between PREOP and PO14 for both parameters ($p < 0.005$ and $p = 0.05$ respectively). SDNN increased from PO1 to PO14 ($p < 0.005$). rMSSD decreased from PREOP to PO1 ($p < 0.001$). A circadian variation was found in the mean heart rate for all 3 monitoring periods ($p < 0.005$). Circadian variation was also present on PREOP for pNN50 ($p = 0.05$) and rMSSD ($p < 0.05$). This variation was missing for both PO1 and PO14. **Conclusion:** Patients had a shift of autonomic tone with reduced parasympathetic activity and lack of circadian variation 14 days after lumpectomy.

No association between the circadian clock gene HPER3 and cognitive dysfunction after non-cardiac surgery

:: Abstract Theme: Sleep and memory/cognition

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Background: The specific clock-gene PERIOD3 is important with regards to circadian rhythmicity, sleep homeostasis and cognitive function. The allele PER35/5 has been associated with worse cognitive performance in response to sleep deprivation. The authors hypothesized that patients with the PER35/5 genotype would have an increased risk of postoperative cognitive dysfunction (POCD) one week after noncardiac surgery. **Methods:** Blood samples were analysed from 93 patients with POCD and 186 patients without POCD from a completed multicenter study. The study population was comprised of patients aged 40 yr and older undergoing noncardiac surgery who were tested

preoperatively and 1 week after surgery with a neuropsychological test battery comprising seven subtests. PER3 genotypes were determined by PCR analysis of DNA from blood samples.

Clinicaltrials.gov identifier NCT01088100.

Results: The frequencies of the 3 genotypes were 11.8 % (32 patients) PER35/5, 41.7 % (113 patients) PER34/5 and 46.5 % (126 patients) PER34/4. No significant difference was found in the distribution of the 3 genotypes according to POCD at 1 week ($P = 0.68$). 12% (6% to 21%) of the patients with POCD and 12% (7% to 17%) of the patients without POCD had the PER35/5 genotype. The difference of the incidence of POCD/-POCD for the PER35/5 genotype was 1% (-7% to 10%). A significantly higher Z-score was found in patients having the PER34/4 in one of the neuropsychological tests (error score of the Concept Shifting Test) (Bonferroni corrected $P = 0.042$). **Conclusion:** No significant association was found between the clock-gene PER35/5 genotype and POCD at one week after noncardiac surgery. If PER35/5 does worsen cognitive performance, the incidence is less than 10% of patients.

Sleep disturbances and changes in the urinary metabolite of melatonin (aMT6s) levels in patients with breast cancer undergoing lumpectomy

Subtitle: Sleep disturbances after lumpectomy

:: Abstract Theme: Sleep and pain

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Background: Sleep disturbances and changes in self-reported discomfort and melatonin secretion are common in the postoperative period. We aimed to study the distribution of sleep stages in the pre- and postoperative period and evaluate changes in the secretion of the melatonin metabolite aMT6s and subjective parameters of sleepiness, pain, general well-being and fatigue in

patients undergoing breast cancer surgery. **Methods:** Twelve patients, 30-70 years, undergoing a lumpectomy were included in the study. PSG monitoring was made the night before surgery (PREOP), the night after surgery (PO1) and approximately 14 days after surgery (PO14). Recordings were scored as awake, light sleep (stage 1 and 2), slow wave sleep (stage 3 and 4) and rapid eye movement (REM) sleep. Sleep stages were analyzed as percent of total sleep time. Self-reported discomfort was assessed using questions about the level of fatigue, general well-being and pain and sleepiness was assessed by Karolinska Sleepiness Scale. Urinary aMT6s was measured by a radioimmunoassay. **Results:** There was significantly decreased REM sleep on PO1 (5.9% of total sleep time) compared with the night before surgery (18.7% of total sleep time) ($p < 0.005$). Patients had fewer episodes of REM sleep on PO1 compared with PREOP ($p < 0.005$). An increase in light sleep was observed on PO1 (68.4% of total sleep time) compared with the night before surgery (55.0% of total sleep time) ($p < 0.05$). No significant changes in total sleep time, sleep latency, sleep period or total time awake were found. The observed sleep changes were normalized after two weeks. No significant changes were found in pain, general well-being, fatigue or sleepiness. aMT6s night secretion showed a non-significant trend towards a decrease from PREOP to PO1 ($p = 0.09$) and a normalization on PO14 ($p < 0.05$ between PO1 and PO14). **Conclusion:** Patients with breast cancer undergoing a lumpectomy had significantly disturbed sleep architecture the night after surgery and these changes were normalized after two weeks.

Sleep Problems in Children with Anxiety and Attention Deficit Hyperactivity Disorders

:: Abstract Theme: Psychiatric sleep disorders

Author: Mrs Berit Hjelde Hansen
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“Sleep problems in children with anxiety and attention deficit hyperactivity disorder”, by Berit

Hjelde Hansen, Akershus University Hospital, Lørenskog, Norway at the 15 th Nordic Sleep Conference, Copenhagen June 8th 2013. **Objective:** To report findings from a study of sleep problems in children with anxiety and attention deficit/hyperactivity disorder (ADHD). **Method:** In a clinical sample of 105 children aged 7-13 years with anxiety disorders (ANX, $n = 41$), ADHD ($n = 39$), or the combination (ADHD+ANX, $n = 25$) the frequency of subjective sleep problems (both overall and types of sleep problems) were compared to those of a group of nonreferred children (CTRL, $n = 36$). Further, the associations between sleep problems and behavioral and attentional functioning, and the persistence of sleep problems were explored. The clinical sample was recruited from 407 consecutive referrals to two child and adolescent outpatient clinics. Referred children were eligible for inclusion if they met the diagnostic criteria for an anxiety disorder and/or ADHD after diagnostic interview (Kaufman Schedule for Affective Disorders and Schizophrenia present and lifetime version, KiddieSADS) with the parents, and no exclusion criteria applied. Controls were recruited from nearby schools, and were eligible for inclusion if they did not meet the diagnostic criteria for an anxiety disorder and/or ADHD, and none of the other exclusion criteria applied. Of the 141 children participating at the initial assessment (T1), 76 of the clinical sample and 31 controls were retained at the follow-up assessment after about 18 months (T2), giving an overall attrition rate of 24.1%. Sleep problems were assessed using the Children’s Sleep Habits Questionnaire (CSHQ), attention was measured by the Attention Network Test (ANT), and behavioral problems by teacher ratings on the Achenbach System of Empirically Based Assessment, Teacher Report Form (ASEBA TRF). **Results:** Children in the clinical sample were reported to have more total sleep problems compared to the controls, and children in the ANX and ANX+ADHD groups more than children in the ADHD group. As to types of sleep problems, children in the ANX and ANX+ADHD groups had more bedtime resistance, sleep onset delay, sleep duration problems, sleep anxiety, parasomnias, and more daytime sleepiness compared to controls. Children in the ADHD group had more sleep disordered breathing problems and more daytime sleepiness compared to controls.

Children in the ANX and the ANX+ADHD group had more bedtime resistance problems than children in the ADHD group. Children in the ANX+ADHD group more night waking than the other groups of children, and more parasomnias than children in the ADHD group. A higher total sleep problem score was significantly associated with reduced efficiency of attentional functioning for both the clinical sample and the controls, and daytime sleepiness significantly predicted internalizing problems as rated by the teacher in children in the ANX group. The persistence rate from T1 to T2 of having sleep problems in a clinical range (total CSHQ score above 41) was 72.4% in the clinical sample. The persistence rates of having a total sleep problem in a clinical range did not differ significantly between children in the ANX group (76.0%), the ADHD group (70.6%), or in the ANX+ADHD group (68.8%). Persistence rates for types of sleep problems varied from 56.3% (bedtime resistance problems) to 86.0% (parasomnias) in the clinical sa

Self-Help Cognitive-Behavioral Therapy for Insomnia (CBT-I): A Systematic Review of Randomized Controlled Trials

:: Abstract Theme: Insomnia – new insight into development and manage

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This study aimed to review current literature, examine the efficacy, adherence, acceptability, and attrition rate of self-help CBT-I, and to explore possible factors that might contribute to the effectiveness of the treatment. A systematic review was performed up to June 2012 on studies published in 6 major electronic databases. Two researchers performed study identification, data extraction, and methodological quality evaluation. Meta-analyses of self-help CBT-I vs. waiting-list, routine care, or no treatment, therapist-administered CBT-I, and placebo treatment were performed. We identified 20 randomized

controlled trials (RCT) that met inclusion criteria. When compared to waiting-list control, self-help CBT-I achieved a moderate to large effect size on improving sleep and reducing sleep-related cognitions and anxiety and depressive symptoms. Therapist-administered CBT-I was slightly better than self-help CBT-I. Subgroup analyses supported the beneficial effect of telephone consultation, but not for “full” multi-component CBT and programs lasting for 6 or more weeks. Treatment adherence, acceptability, perceived usefulness, and credibility were reported as satisfactory. Based on the results of the systematic review, we have designed a Chinese-language self-help CBT-I and now conducting a RCT to evaluate the efficacy of Internet-based self-help CBT-I in Chinese population.

Radiofrequency Surgery of the soft Palate versus Placebo on Daytime Sleepiness in Snoring Men. -A Randomised Controlled Trial

:: Abstract Theme: Practical issues in the management of sleep disord

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Objectives/Hypothesis: To evaluate the effect of radiofrequency surgery in the soft palate on daytime sleepiness in snoring men with or without mild sleep apnoea. **Study design:** Randomized controlled trial. **Methods:** Thirty-five men were consecutively recruited among patients referred to ENT- clinic due to snoring and complaints of daytime sleepiness. Inclusion criteria were apnea/hypopnea index (AHI) 15 or below. Patients were randomized to radiofrequency of the soft palate (RF) or sham surgery. The patients were given the option of one to three treatments and all, but one, chose and received three treatments. At follow-up 12 months after the last radiofrequency or sham surgery treatment, all patients underwent a new nocturnal sleep apnea recording. Primary outcome was daytime

sleepiness measured, before surgery and at follow-up, using the Epworth sleepiness scale (ESS) and other questionnaires. Secondary outcomes were changes in AHI index and subjective snoring. Results: Thirty-two of the patients fulfilled the study, 19 in the RF surgery group and 13 in the sham-surgery group. No differences between the two groups concerning changes in ESS or AHI values were found at the 12 month follow-up. Body mass index did not change during the observation period. One patient regretted his participation. Conclusion: In this study, radiofrequency surgery of the soft palate has no effect on daytime sleepiness in snoring men with an AHI <15. Key words: Radiofrequency, sham surgery, randomized controlled trial, daytime sleepiness, snoring, sleep apnea syndrome.

Sleep apnea and cardiovascular diseases.

Subtitle: Does treatment affect health outcome?

:: Abstract Theme: Sleep disorder breathing and metabolic syndrome

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The speaker defended his PhD thesis in January 2013. The thesis is one of five sub-studies from Akershus Sleep Apnea Project. A brief review of potential mechanisms for the relation between cardiovascular diseases and sleep apnea is presented. Further, recently published studies from the Akershus Sleep Apnea Project exploring relations between sleep apnea and markers of cardiovascular diseases is presented and discussed. Finally, treatment options through the severity specter of OSA is discussed based on available systematic reviews of the OSA literature.

Tailored behavioral sleep medicine intervention for enhanced physical activity and healthy eating in patients with obstructive sleep apnea syndrome and overweight

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Aim: To evaluate the effects on physical activity (PA) and eating behavior (EB) of a tailored behavioral sleep medicine (BSM) intervention and first-time continuous positive airway pressure (CPAP) treatment compared with first-time CPAP treatment and advice, in patients with obstructive sleep apnea syndrome (OSAS) and overweight. Methods: 73 patients ((mean \pm SD) 55 ± 12 years) with overweight (BMI 34.5 ± 4.8) and moderate or severe OSAS (AHI 41.7 ± 20.9) were randomized to control group (CPAP and advice on the association between weight and OSAS) or experimental group (CPAP and a 6-month BSM intervention targeting PA and EB). At baseline and at follow-up, EB (food frequency screening and Dutch Eating Behavior Questionnaire), weight, BMI and waist circumference were assessed at one point, while PA and sedentary time (ST) were measured with accelerometry during 4 days. Results: The experimental group lost 2.7 kg (± 4.6) in weight and 3 cm (± 4.9) in waist circumference, significantly more than controls. At 6 months, the experimental group ate more fruit and fish than the control group. Time spent in PA did not change over time. Regarding BMI, steps and ST, there were within-group differences. Conclusions: A BSM intervention targeting PA and EB does not change PA but facilitates changes in EB, and subsequent anthropometric effects, in patients with OSAS and overweight. It might require higher PA quotas or a period longer than 6 months to reveal behavioral changes of larger proportions.

Sleep and hypothalamic function in Craniopharyngiomas

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HYPOTHESIS: Hypothalamic damage by local tumor might involve the suprachiasmatic nucleus, and thereby melatonin secretion, leading to disturbed circadian function, sleepiness and fatigue. **OBJECTIVE:** To assess the influence of craniopharyngiomas (CP) or their treatment on melatonin secretion, and the association with fatigue, sleepiness, sleep pattern and sleep quality. **SUBJECTS AND MEASURES:** In 15 CP patients and 15 gender, age and BMI matched healthy controls 24h-salivary melatonin and cortisol were measured. Sleep-wake patterns were characterized by actigraphy and sleep diaries. Sleepiness, fatigue, sleep quality and general health were assessed by questionnaires. **RESULTS:** The patients had lower general health ($p=0.01$) and increased mental fatigue ($p=0.05$), daytime dysfunction ($p=0.05$) and sleep latency ($p=0.04$) compared to healthy controls. Patients had lower AUC-melatonin ($p=0.04$) and higher evening cortisol concentrations. Low midnight melatonin concentrations were associated with reduced sleep time ($p=0.03$) and efficiency ($p=0.02$). High midnight cortisol concentrations were associated with an increased number of awakenings ($p=0.02$). Midnight melatonin remained independently related to sleep time after adjustment for cortisol. **CONCLUSION:** Data indicated a relationship between midnight melatonin and sleep time, sleep efficiency and physical activity, which may be due to the influence of the CP or its treatment on the circadian and sleep regulatory nuclei.

Morbidities in Rapid Eye Movement Sleep Behavior Disorders

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Idiopathic Rapid Eye Movement (REM) Sleep Behavior Disorder (iRBD, RBD without any obvious comorbid major neurological disease), is strongly associated with numerous comorbid conditions. The most prominent is that with neurodegenerative disorders, especially synuclein-mediated disorders, above all Parkinson Disease (PD). Idiopathic RBD is an important risk factor for the development of synucleinopathies. Comorbidity studies suggest that iRBD is associated with a number of other potential pre-motor manifestations of synucleinopathies such as, cognitive and olfactory impairment, reduced autonomic function, neuropsychiatric manifestations and sleep complaints. Furthermore, patients with PD and RBD may have worse prognosis in terms of impaired cognitive function and overall morbidity/mortality; in dementia, the presence of RBD is strongly associated with clinical hallmarks and pathological findings of dementia with Lewy bodies. These findings underline the progressive disease process, suggesting involvement of more brain regions in patients with a more advanced disease stage. RBD is also associated with narcolepsy, and it is likely that RBD associated with narcolepsy is a distinct subtype associated with different comorbidities. RBD is also associated with antidepressant medications, autoimmune conditions, and, in rare cases, brainstem lesions.

Societal burden of Sleep disorders

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Sleep disorders includes a number of disorders of which some are common (e.g. insomnia, sleep apnoea), some more rare (e.g. narcolepsy,

specific nocturnal seizure disorders). Burden, consequences and effect of treatment are still inadequate understood. Best description of societal burden exist for sleep apnoea, in part insomnia, narcolepsy and restless legs syndrome, whereas there are almost no data addressing nocturnal movement disorders, nocturnal epilepsies and parasomnias.

Available data all show consistent influence on quality of life, partners quality of life and increased morbidities in insomnia, sleep apnoea, restless legs syndrome and narcolepsy. Further data shows increased morbidities and social consequences, which is associated with increased direct and indirect costs. This is supported by Danish national data suggesting very high direct and indirect costs.

There are currently low awareness and of sleep disorders. Action should be taken to understand and focus on issues regarding sleep disorders, its prevention, identification and management.

Funding of research should be increased.

Research should include international collaborations for further advances in sleep.

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Music for PTSD-related sleep disturbances in refugees

:: Abstract Theme: Psychiatric sleep disorders

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Sleep disturbances are prevalent among persons suffering from the consequences of traumatic experiences, and insomnia symptoms and nightmares are included in the diagnostic criteria of the PTSD diagnosis. One group that is often severely affected by the negative consequences of persistent sleep problems is traumatized refugees. The aim of this pilot study was to determine whether the subjective sleep quality of traumatized refugees could be improved by listening to music at bedtime, and if such an improvement would affect the experience of trauma symptoms and well-being. A repeated measures design was used, and the dependent variables, including subjective sleep quality, trauma symptoms and well-being, were measured by standardized questionnaires. Fifteen traumatized refugees with sleep problems participated in the study. The intervention group received a music player designed to be used in bed every night for one month and an ergonomic pillow. The control group received only the pillow. Statistical comparisons showed a significant improvement of sleep quality in the music group, but not in the control group. In addition, the music group experienced significantly more improvement in sleep quality than the control group. A significant increase in well-being was found in the intervention group, but there were no changes in trauma symptoms in either of the groups. These results indicate beneficial effect of music listening at bedtime on sleep quality in traumatized refugees.

Job strain, napping and sleepiness in shift working health care staff

:: Abstract Theme: Normal sleep and aging

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Job strain, napping and sleepiness in shift working health care staff Karhula K, Härmä M,

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Objective Job strain and shift work challenge employees possibilities to sleep sufficiently. We explored the association of job strain with napping, sleepiness and alertness in shift working health care staff.

Methods From the Finnish Public Sector Study, hospital wards with high or low average level of job strain were identified. Shift working female health care staff (n=95) who had worked >3 years in the same ward and who evaluated their job strain high in high-strain wards (HJS, n=42) or low in low-strain wards (LJS, n=53) participated. For 3 weeks, main sleep periods and naps were measured with actigraphy and sleep diary. Sleepiness was evaluated with Karolinska Sleepiness Scale (KSS). Psychomotor Vigilance Test (PVT) was performed during one morning and night shift and day off.

Results The mean sleep length (6:49h) was the same in both stress groups. Compared to the HJS-group, the LJS-group took more often (72%) and longer naps (61 min) before first night shift (45%, 35 min, $p=0.01$). The HJS-group rated more often severe sleepiness (KSS 5-7) than the LJS-group in connection quick returns (26 vs. 8%, $p=0.04$). Although the majority of nurses experienced often severe sleepiness during night shifts, occurrence of at least one PVT lapse was more common in the HJS (39%) than in the LJS-group (25%) during the night shift ($p=0.02$).

Conclusion In shift workers, job strain is associated with infrequent napping behaviour, severe sleepiness and reduced vigilance. Our results call for individual and organisation-based actions to promote sleep in shift working nurses, especially with high job strain.

Strong evidence for an increased traffic accident risk in OSA - data from a nationwide accident registry

:: Abstract Theme: Sleep disordered breathing – new challenges

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Background Obstructive Sleep Apnea (OSA) has been associated with an increased risk for traffic related accidents. The present study aimed to compare the incidence of traffic accidents (TA) among an unselected group of OSA patients with the corresponding number in the general population and to further evaluate the interventional effects of Continuous Positive Airway Pressure (CPAP) therapy on accident rate.

Methods Patients (n=1718) were recruited from the European Sleep Apnea Database (ESADA) and traffic accident information was captured from the Swedish Traffic Accident Data Acquisition Registry (STRADA) where all police reported accidents are reported. The expected number of MVA's in the general population was calculated from the STRADA registry based on the distribution of the ESADA patients in the different regions of the greater Gothenburg area (appr. 1,000,000 inhabitants). The observed number of accidents in the patient group was compared with the total number of TA in the general population categorized in comparable age and municipality groups.

Preliminary results Compared with controls, a STRADA accident report was 2-3 fold more common among patients with OSA and peaked at 7.8 accidents /1000 inhabitants per year in the 19-44 years old age group. Severity of OSA (AHI) or subjectively reported sleepiness (ESS) at the time of investigation did not predict accident risk. Treatment (CPAP) of patients with moderate to severe OSA reduced, but did not fully eliminate accessed accident rate (from 9.5 to 5.4 accidents/1000 inhabitants/yr). There was no change in accident rate in patients not adhering to treatment (11.6 and 12 accidents/1000 inhabitants/yr).

Discussion The preliminary results from our study underlines that patients diagnosed with OSA suffer from a 2-3 fold risk of traffic accident compared to the general population. The access risk is almost eliminated by treatment. Data from the unique STRADA accident registry our study clearly supports that untreated OSA constitutes a serious traffic safety concern.

Genetic support for the autoimmune pathogenesis of narcolepsy

:: Abstract Theme: Narcolepsy and other central hypersomnias: recent

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The sleep disorder narcolepsy with cataplexy is caused by a specific loss of the hypocretinergic neurons in hypothalamus. The disorder almost exclusively occurs in individuals with the tissue type HLA-DQB1*06:02. This has lead researchers to hypothesize that the pathogenesis of narcolepsy has an autoimmune component, but it has been difficult to find immunological evidence for this hypothesis. Genetic studies of narcolepsy with cataplexy have reported associations with the T-cell receptor alpha gene (TCR α) and the P2RY11 gene, and recent studies have further discovered genetic associations with two novel narcolepsy loci, Cathepsin H (CTSH) and Tumor necrosis factor (ligand) superfamily member 4 (TNFSF4, also called OX40L). The involvement of TCR α , CTSH and TNFSF4/OX40L in disease pathogenesis is interesting as these proteins have key roles in antigen processing and presentation. This suggests that specific interactions at the immunological synapse constitute the pathway to development of narcolepsy. P2RY11 is particular interesting as this receptor is highly expressed in both the brain and immunesystem, and is known to be involved in cell death regulation. In conclusion, these findings suggest T cell mediated autoimmunity to be a possible driving factor in the pathophysiology of narcolepsy.

The Swedish National Narcolepsy Register

Subtitle: A new quality register after the Pandemrix vaccination

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After the suspicion arose that children in Sweden may have got narcolepsy after vaccination with Pandemrix against swine flu, there were several actions taken in order to analyse and follow the situation. One important step was to form a national register on narcolepsy. The development of this register arose from the Swedish National MS Register. Aim: To include all persons with narcolepsy in the country, but with the first focus to reach the children and young persons struck by disease after the Pandemrix vaccination.

Preliminary results: A register module has been developed, including basic parameters about onset, investigation and course. Instruments are included to monitor hypersomnia (EES), cataplexy (Stanford), and also EQ5D and QoL instrument SF 36. An instrument for registering psychological symptoms is since collaborators in pediatric neurology, who emphasize that the young patients affected after the vaccination may have more problems of this type. The register includes a site for registering side effects which is important in long lasting or chronic treatment. The parent group of children affected after vaccination has given important input. The register gives a possibility to easily monitor the patients. The register was established in April 2012. A national net work of persons, mostly neuropsychiatrists and neurologists, who register patients is now being formed. By april 2013, about 150 patients are registered.

Update on the Kleine Levin syndrome

Subtitle: Radiological and clinical support of the diagnosis KLS

:: Abstract Theme: Practical issues in the management of sleep disorder

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Background: When teenagers start to suffer from sleepiness, it is often regarded as a common,

almost "normal" issue. It is however very important to develop tools for the diagnostics of hypersomnia in young people, bearing in mind that some of them may have got narcolepsy from the Pandemrix vaccination in Europe, that some will suffer from a delayed sleep phase syndrome, triggered by computer game use in the night, and some, finally might have the Kleine Levin syndrome, a rare and to a big extent unknown condition. **Methods:** In our clinic we have studied young and older persons with KLS since 1992, in all 30 patients, and have described clinical and radiological findings, that presently are used as tools in our clinical investigation. Radiology have revealed typical changes, as well as neuropsychological testing outside the hypersomnic periods. **Results:** We have observed a high frequency of hypoperfusion in the frontal and temporal parts of the brain (SPECT, Ceretec), and fMRI on a group level has shown a change of activation in the thalamus compared with healthy subjects, when applying a cognitive paradigm. SPECT is included in our investigation routine, but fMRI is still developed further before we can use it in the individual case. Neuropsychology has demonstrated a high proportion of patients with a disturbance in their working memory, often a "narrow" and big effect reaching low Stanine levels in a specific domain, like auditory, visual, arithmetic or verbal.

Daylight exposure in the in-door working population in Sweden, relation to sleep, wakefulness and health.

:: Abstract Theme: Basis of Sleep

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Daylight exposure might be essential for regulation of circadian rhythms and sleep. Little light could possible relate to sleep problems, elevated sleepiness and fatigue at work. To further test this, the Swedish Longitudinal Occupational Survey of Health (SLOSH) of 2012 was analysed.

The database included 7324 workers, females (55.8%), mean age =50.1 yrs (range 24-73 yrs). On workdays the reported outdoor exposure was ≤1 h in 55.3% for in-door workers, exposure being longer in males and increasing by age. Exposures increased on free days (≤1 h =12.9%). At work, 86.5 % worked within 5 m from a window. Those having problems with lowered mood, fatigue and lack of energy in autumn/winter amounted to 43.1%. Of these, 20.9%, reported severe/marked problems. A multivariate analysis (control: age, sex, education) showed sleep problems were related ($p<0.001$) to lack of light exposure in connection to work (and leisure) and distance to window. The relationship was most pronounced for difficulties to initiate sleep, waking, repeated awakenings, not being restored and mental and physical exhaustion. Light exposure was associated with an earlier onset of sleep ($p<0.001$) as well as an earlier rise time ($p<0.001$). Self-rated health was lowest in the group with low daily exposures (<30 min). In summary, data clearly indicates that lowered exposure to natural daylight among in-door workers negatively affects sleep, possible daytime functioning and health perception.

The post- stroke (PS) insomnia treated by special pulse electric field (PEF) and bright blue light.

:: Abstract Theme: Sleep in neurological disorders

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Objective: To research the dynamic of sleep disorders, psychosomatic, neurotransmitters indices changes under pulse low frequency low intensity electromagnetic field (PEF), bright blue light effect in PS insomnia patients. **Methods:** It had been examined 120 PS patients by double-blind controlled method of study. They had dizziness, insomnia, anxiety, sadness. The main group (80 patients) had received drugs, the PLEF

and photo-treatment, which had begun within 3 weeks of acute ischemic stroke onset. The PLEF (1 mv/cm, 30 Hz), directed to the head with blue bright light 1000 lux in the morning, 10 days. The 1-st control (20 patients) applied electric field-placebo, drugs. 2nd control (20 patients) were used only drugs. The brain activity had been controlled by electroencephalography (EEG), MMPI test, neuro-haemodynamics changes. The effectiveness of the treatment was estimated basing on insomnia, another psychosomatic indices changes, and the dynamic of neurotransmitters. Results and Discussion: It was established improvement of brain activity, the correction irregular sleep-wake rhythm disorder. It was indicated the decrease glutamate blood level, what pointed to decrease brain excitotoxicity effects, the control melatonin and reduction of cortisol and, improvement cognitive disorders, improved locomotor functions. The study showed, sedative and antidepressant effects. Conclusion: It was established the control psychosomatic, sleep indices disorders in the examined and treated patients.

Eveningness is related to the increased risk for bronchial asthma and nocturnal asthma

:: Abstract Theme: Burden of sleep disorders

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Eveningness has been associated with the increased risk for a range of health hazards such as sleep problems, depression, type 2 diabetes, and hypertension. Our aims were to study, whether eveningness was related to the increased odds for respiratory symptoms and diseases. Data was based on self-reported questionnaires filled in by participants from a random sample of population aged 25 to 74 living in five large geographical areas in Finland (N=6089). After controlling for socio-demographic and lifestyle factors, Evening-types had higher odds, as

compared with Morning-types, for wheezy breathing as such or without respiratory infection (OR=1.6 and OR=1.9, respectively), awakening in shortness of breath or coughing (OR=1.8 and OR=1.4, respectively), a diagnosed or treated bronchial asthma (OR=1.9) and its medication, past or current (OR=1.5 and OR=1.5, respectively), as well as hay fever or allergic respiratory symptoms (OR=1.5). Therefore, our results suggest that eveningness associates with the increased risk for the bronchial asthma and nocturnal asthma in particular. It is possible that Evening-types may expose to disruption of circadian clock functions more often than others that could at least partly explain these results.

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Central and Peripheral Circadian Pacemakers

:: Abstract Theme: Basis of Sleep

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Living systems possess an exquisitely accurate internal biological clock that times daily events such as sleep and wakefulness. Half a century ago the suprachiasmatic nucleus (SCN) of the hypothalamus was identified as the central circadian pacemaker driving behavioural and neuroendocrine circadian rhythms. Circadian oscillations are generated in specific cells expressing a set of genes in a timely sequential manner forming an autoregulatory transcriptional feedback loop. In mammals, these "clock genes" include Clock, Bmal1, Per1, Per2, Cry1, Cry2 and Nr1d1, as well as another dozen candidate genes that play additional roles in the clock gene

network. The discovery of the clock genes was followed by the detection of clock gene expression in a number of peripheral tissues. About 3-10% of transcripts in a given tissue exhibit circadian rhythms. Some of these tissues exhibit autonomous circadian oscillations in isolation, whereas most peripheral oscillators still require an input from the SCN. The input from the SCN to these oscillators can be mediated via the sympathetic nervous system, but also the temperature and hormones like glucocorticoids are mediators. The peripheral clocks are also locally influenced by other cues such as feeding and internal metabolites. We have in our laboratory by use of semiquantitative in situ hybridization and qRT-PCR shown the presence of peripheral clocks characterized by rhythmic clock gene expression in neurons of the neocortex and the cerebellar cortex. The circadian rhythms of both of these oscillators are generated by the SCN. The peripheral clock in the neocortex might be involved in the neurobiology generating circadian symptoms in neuropsychiatric diseases, whereas the function of the molecular clock of the cerebellum is up to now enigmatic.

EEG-viewer an EEG analysis and development system

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Developed at the Danish center for sleep medicine, The department of Clinical neurophysiology, Glostrup Hospital

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At the Danish center for sleep medicine we have developed our own EEG analysis system (EEG-viewer). The purpose of the system is to:

- Offer user friendly and fast traditional manual sleep scoring (hypnogram and events)
- Have a system where new algorithms developed at our department by the staff or students can be implemented and made available to others.
- Address limitations in our commercial systems (reports and analysis methods)

- Offer flexible and easy import/export of EDF based EEG recordings

Examples of implemented and planned features in EEG-viewer:

- Automatic muscle activity detection
- Automatic hypnogram scoring
- EEG sonification
- Advanced ECG analysis
- Extended sleep reports
- Export the whole or part of the PSG recording

sleep apnea and sleep disordered breathing in children

:: Abstract Theme: Practical issues in the management of sleep disorder

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Breathing and sleep are characterized by immaturity and irregularity initially in life. Concomitant with increased respiratory regularity, hypoxic and to some extent hypercapnic ventilatory response improve as do airway control and the mechanics of the respiratory system. In some elements of immaturity persist as clinical pathologies later in life. Sleep related respiratory disturbances include disorders that are predominantly periodic as ALTE and obstructive sleep apnea (OSAS) as well as disorders with a more sustained profile of hypoventilation like neuromuscular disorders, CCHS, facial malformations, cystic fibrosis and bronchopulmonary dysplasia. Diagnosis is based on clinical presentation, in some cases pediatric sleep questionnaires, nocturnal monitoring including continuous CO₂-monitoring when hypoventilation is suspected or has to be ruled out, and PSG when somnologic issues are suspected to part of the problem. Treatment will address the pathology in question. OSAS in children should initially be treated with adenotonsillectomy, and in some residual cases also with CPAP. A number of facial malformations should be approached with the appropriate surgery, and most conditions presenting with hypoventilation should be treated with non-

invasive positive pressure ventilatory support. In severe cases invasive ventilatory support is often the chosen treatment. Follow-up is mandatory.

A change from obstructive to central sleep apnea as first sign of brain stem meningioma.

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Background: Central sleep apnea (CSA) is characterized by periods of absent attempts to breathe and is believed to be caused by brain stem lesions of varies origin. In contrast, obstructive sleep apnea (OSA) is associated with upper airway anomalies and obesity and is much more common. Here, we present a case of typical OSA, which developed progressive CSA due to brain stem meningioma. **Case/Results:** A woman, aged 38, with a BMI 45, was diagnosed with OSA in September 2011 with AHI of 81 (91% obstructive, 9% central). No neurological symptoms found or reported at time of referral. CPAP treatment was initiated but due to inefficient treatment (AHI > 30), the patient was referred to our sleep center for second opinion. In May 2012 we measured AHI of 103 (17% obstructive, 83% central) and she was referred to MRI of cerebrum which revealed a 3x1,5x2,3 cm meningioma, located anterior to medulla oblongata with severe displacement hereof. **Conclusion:** Clinicians should be aware that a shift from OSA to CSA can be a sign of structural pathology in the brain stem.

Sleep disturbances are common in patients with fatigue-related problems

:: Abstract Theme: Sleep in neurological disorders

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Aim: To evaluate sleep disturbances with questionnaires and polysomnography in patients with fatigue-related problems. **Methods:** Patients were referred to Myalgic Encephalomyelitis (ME)/Chronic Fatigue Syndrome (CFS)-project for fatigue and suspected diagnosis of ME/CFS. **Criteria** for further referral to lab for full night polysomnography (PSG) were their responses of questionnaires. They should either have often or always daytime or morning tiredness and/or Epworth sleepiness scale (ESS) of 10 or more. **Results:** 38 consecutive patients fulfilled the criteria and underwent PSG, 32 women and 6 men, mean age 45.2 (SD 10.1), mean BMI 24.9 (3.8). Diagnosis of ME/CFS was given to 31 patients (82%), while 7 patients had other disorders explaining fatigue. RLS questionnaire showed that 21 (55%) fulfilled the criteria of four positive RLS questions. The meanscore in ESS questionnaire was 8.3 (5.9). PSG showed that mean Apnea-hypopnea Index (AHI) was 5.8 (16.3), and 29 (76%) patients fulfilled the criteria of Obstructive Sleep Apnea (OSA) with an AHI >5. Periodic Limb Movement Index (PLMI) >5 was detected in 10 patients; mean PLMI was 7.2 (16.4), and mean PLM Arousal Index in 8 patients was 1.2 (3.8). 10 patients (26%) had a combination of OSA and PLM. 6 (16%) patients had normal PSG, among them 5 diagnosed with ME/CFS. **Conclusion:** In patients with fatigue and suspected ME/CFS, sleep disturbances are common, and the patients should undergo PSG before the final ME/CFS diagnosis is set.

Sleep and sleep problems when staying in hotels

:: Abstract Theme: Quality and educational aspects

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Objectives: No previous epidemiological study has investigated how people sleep in hotels despite that fact that a good night's sleep in hotels is regarded as an essential trigger point in terms of selection of accommodation. The aim of the present study was to assess how people sleep in hotels compared to at home and which factors that in general are reported to often or always disturb sleep in hotels. **Methods:** 2 504 subjects were recruited through a link in a national online newspaper to participate in a web-based survey about sleep and sleep problems while staying in hotels. The respondents were asked to provide information about demographics, how they usually slept in hotels (sleep onset, sleep maintenance, early morning awakening, sleep quality) compared to at home and factors often or always disturbing sleep in hotels. **Results:** On average the respondents reported sleeping poorer in hotels than at home on all sleep parameters. The four disturbing factors reported by over 15% of the respondents were bad pillows (25.4%), too high room temperature (22.8%), bad mattresses

The impact of CPAP treatment on life satisfaction and close relationships in patients with sleep apnea

:: Abstract Theme: Burden of sleep disorders

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Introduction: The present study investigates life satisfaction and close relationships in male and female patients with Obstructive Sleep Apnea, before and after 1 year of CPAP-treatment.
Material and Methods: Study design: Consecutive inclusion of male (n = 150) and female (n = 46)

patients with OSA scheduled for treatment with CPAP. After informed consent the patients were asked to fill out a questionnaire on two different occasions: before start of CPAP-treatment and after 1 year of CPAP-treatment. We selected four questions from LiSat-11; one investigating general satisfaction (Life as a Whole) and three investigating closeness (Family Life, Partner Relation and Sexual Life). Epworth Sleepiness Scale was used to investigate daytime tiredness. Results within the groups and between genders are shown. **Results:** With respect to life satisfaction we found no significant difference. When looking at the three questions on closeness, we only found a significant improvement in Sexual Life in the male group after one year in CPAP treatment. No other items showed any significant improvement. In both groups daytime tiredness was reduced after one year of CPAP-treatment. **Conclusion:** Except for improved sexuality in male patients, no significant change can be seen in life satisfaction and close relationships in our patients after one year of CPAP-treatment. Although no improvement is seen in these items, the results indicate that CPAP-treatment per se does not have a negative impact on life satisfaction and close relationships. This is important information to patients who finds CPAP-treatment cumbersome and stigmatizing. **Key words:** Life satisfaction, closeness, OSA, CPAP

A randomized controlled trial on the sleep phase advancing effects of bright light and melatonin in treatment of delayed sleep phase disorder.

:: Abstract Theme: Monitoring and management of sleep disorders

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Objectives: To investigate short- and long term effects on sleep of morning bright light and

evening melatonin in adolescents and young adults with delayed sleep phase disorder (DSPD) in a randomized controlled trial (RCT) and an open label follow up study. **Methods:** 40 patients with DSPD received treatment for 2 weeks in one of 4 conditions (dim light/placebo capsules, bright light/placebo capsules, dim light/melatonin capsules, bright light/melatonin capsules). During follow up (3 months) patients received no treatment or treatment with bright light/melatonin. End points were subjective/objective sleep (sleep diary/actigraphy). Data were analysed using 2-way ANOVAs. **Results:** In the RCT sleep was advanced in all treatment conditions (bed time $02:19 \pm 109$ to $01:24 \pm 114$ averaged across the groups, $p < .0005$; rise time $11:06 \pm 130$ to $08:44 \pm 132$, $p < .0005$), with no interaction effects (bed time $p = .744$; rise time $p = .794$). At follow up, the treatment group had maintained advanced sleep with respect to baseline (bed time $p = .013$; rise time $p < .0005$) whereas the no-treatment group had relapsed to baseline levels (bed time $p = .339$; rise time $p = .521$), yielding significant interaction effects (bed time $p = .041$; rise time $p = .003$). **Conclusion:** The 2 week intervention produced a sleep phase advance irrespective of treatment condition. At follow up, treatment had allowed maintenance of the advanced sleep phase whereas termination of treatment had caused relapse into delayed sleep times.

Delayed sleep phase in adolescents

:: Abstract Theme: Sleep in pediatry

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During puberty a delay of the sleep/wake rhythm normally occurs. A delayed sleep phase is associated with negative outcomes such as depressed mood, reduced academic performance and bad health behaviours. At the most extreme, a delayed sleep phase may reflect delayed sleep phase disorder (DSPD). DSPD is assumed to be the most common circadian rhythm sleep disorder, in particular in adolescents and young

adults. Still, its prevalence and pathophysiology have not yet been firmly established. In this symposium I will describe the adolescent sleep patterns and present data on the prevalence and correlates of delayed sleep phase. I will also describe the characteristics of DSPD in terms of sleep and circadian rhythm. Bright light and melatonin are currently considered the optimal options for treatment of DSPD, but few clinical trials have addressed its short- and long term effects in adolescents, and no guidelines for treatment exist. I will present results from a randomized controlled trial in which the effects of a treatment protocol involving the use of bright light and melatonin together with adjunct behavioural instructions in adolescents and young adults with delayed sleep phase disorder were investigated. The results indicate that long-term use of timed bright light and melatonin may allow patients with DSPD to maintain an advanced sleep phase over time.

Validation of BodyMedia's SenseWear™ Armband for Determining Sleep and Wake in Patients with Obstructive Sleep Apnea

:: Abstract Theme: Quality and educational aspects

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Introduction: The BodyMedia's SenseWear™ Armband (BSA) is a portable device has a built in algorithm that can identify sleep and wakefulness based on arm movement. Obstructive sleep apnea (OSA) is a special group of patients who have excessive movements during sleep, which may affect the accuracy of BSA algorithm in scoring sleep and wake. **Objectives:** To evaluate the validity of the BSA device in detecting sleep-wake pattern and sleep efficiency in patients with obstructive sleep apnea (OSA). **Material and Methods:** Simultaneous overnight recordings of in-laboratory polysomnography (PSG) (using EEG channels F3-F4, C3-C4, O1-O2, and M1-M2) and BSA were performed on (1) 107 OSA and 30 controls matched with OSA patients for age and

BMI. PSG was scored manually according to the American Academy of Sleep Medicine guidelines. Results: There was no significant difference in both OSA and control patients between BSA and PSG with regard to total sleep time, total wake up time and sleep efficiency. There were also strong correlations between BSA and PSG with regard to total sleep time ($r=0.84$; $p<0.001$), total wake up time ($r=0.61$; $p<0.001$) and sleep efficiency ($r=0.52$; $p<0.001$). Bland Altman plots showed strong agreement between total sleep time, wake up time and sleep efficiency for both OSA and the controls. Conclusion: Results suggest that BSA is a reliable method for determining sleep in patients with and without OSA when compared against the gold standard(PSG).

How common is sleep bruxism in the general population?

:: Abstract Theme: Sleep related movement disorders, diagnostic and m

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Objectives: Sleep bruxism (SB) is a stereotyped movement disorder characterized by grinding or clenching of teeth during sleep. This study aimed to estimate SB in the general population. Methods: Data were obtained from 426 adults aged 41-66 years. All subjects answered questionnaires and were invited for an ambulatory type 3 sleep study with audio and electromyography of masseter muscles. Identification of SB was based on manual scoring and AASM diagnostic criteria. SB identification was based on bruxism episode index (BEI), per hour of sleep (phasic, tonic and mixed). Low frequency SB was characterized by $BEI \geq 2$ and high frequency SB by $BEI \geq 4$. Results: Preliminary findings for the first 287 subjects show a 19.5% prevalence of SB in the general population (5.6% with high frequency and 13.9% with low frequency). The 16 subjects with high frequency SB had on average \pm SD 6.0 ± 2.1 BEI while the

24 subjects with low frequency had on average \pm SD 2.8 ± 0.6 . Grinding or clenching teeth occurring at least weekly was reported by 11% of subjects. However only 3 out of 16 subjects with high frequency SB and 3 out of 40 with low frequency SB reported teeth grinding or clenching. The majority of subjects reporting teeth grinding or clenching did not have measurable SB during the sleep study. Conclusion: The discrepancy between the number of subjects with measurable SB and the reporting of teeth grinding or clenching, suggests that either the subjects are unaware of their condition or

Validation of automatic analysis of respiratory events

:: Abstract Theme: Sleep disordered breathing – new challenges

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Introduction: A reliable automatic analysis of respiratory and oxygen desaturation events in sleep studies can decrease the time needed for manual scoring. This study aimed to assess the validity of automatic vs. manual analysis and verify obstructive sleep apnea (OSA) categorization. Methods: A general population cohort ($n=27$) was assessed twice ('06/'12). The first study was performed with Embla A10 (Natus Medical Inc) but the latter with T3 device (Nox Medical). All studies were scored in Noxturnal software. Recordings with no cannula flow signal were scored using respiratory inductive plethysmography (RIP) flow. Results: The apnea hypopnea index (AHI) ranged from 0-20 events/hour in the Embla recordings and 0-23 in the T3 by manual scoring. The Embla recordings showed a correlation of $r=0.96$ between automatic and manual scoring for AHI and $r=0.99$ for oxygen desaturation index (ODI). For T3 recordings the correlation was $r=0.98$ and $r=1.00$, respectively. For Embla recordings the sensitivity and specificity of the automatic scoring

was 0.89 and 0.81 for AH events and 1.00 and 0.88 for OD events. For T3 it was 0.94 and 0.74 for AH events and 1.00 and 0.97 for OD events, respectively. When looking at how subjects were classified by OSA category (non OSA (AHI<5), mild OSA (AHI 5-15), moderate to severe OSA (AHI≥15)) using automatic analysis only, we found that 19% of individuals fell in to the wrong category when diagnosed with Embla and 41% when diagnosed with T3. AHI was overestimated in 93% of wrongly classified cases. Discussion: The automatic scoring was acceptable regarding sensitivity and specificity of AH and OD events but its tendency to overestimate respiratory events makes OSA categorizing inaccurate so manual overview is recommended.

The validity of automatic analysis of snore sound

:: Abstract Theme: Sleep disordered breathing – new challenges

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Abstract: Introduction: The objective measurement of snoring in clinical studies and large research cohorts is hindered by the time-consuming manual analysis needed. This study aimed to assess the validity of an automatic analysis of snore sound vs. manual analysis by a trained sleep technologist. Methods: Snorers were assessed with in-laboratory polysomnography (Embla A10, Natus Medical Inc) and a simultaneous type 3 study including a chest microphone (T3 device, NoxMedical). The automatic scoring used included an adaptive

threshold detection with four-fold amplitude and 0.1-3 sec criteria for a snore event. Also ≥50% of the snore event had to overlap periods of inhalation, audio center frequency had to be <500Hz and not occur during movement. Snore trains were defined as ≥3 snores in a row (one breath event without snoring in between allowed). Manual scoring was based on listening for and scoring all audible snores and snore trains. Results: Our preliminary findings were performed for five snorers (4 females and 1 male). The subjects spent 18.9 to 55.7% of the night in snore trains (snore train duration/index time) as assessed by manual scoring. A correlation of $r=0.85$ was found between automatic and manual scoring of snore train percentage, but the automatic scoring underscored the snoring in all five subjects. The average sensitivity and specificity of the automatic scoring was for 0.54 and 0.97 respectively for snore events and 0.47 and 0.87 respectively for snore trains. Discussion: The automatic analysis had good specificity for the assessment of snores but low sensitivity. Therefore subjects with a high automatic snore index can be considered a true snorer but the subjects with a low automatic snore index may have undetected snoring.

Narcolepsy in Norway after H1N1 vaccination

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The prevalence of narcolepsy in Norway is 0.022%, similar to what has been found in Finland and other European countries. Based on calculated incidences from other European countries the incidence is estimated to be 0.5-1/100 000/ year.

During October 2009 through January 2010 around 470 000 children aged 4 -19 were vaccinated with Pandemrix against influenza AH1N1, with a vaccination coverage of about 50%. Due to alerts from Finland and Sweden, children and adolescents with onset of narcolepsy after the vaccination were registered by the National Institute of Public Health in cooperation

with the Norwegian Resource Center for AD/HD, Tourette Syndrome and Narcolepsy. 60 vaccinated children were reported with narcolepsy onset between January 2010 and December 2011. 42 of them had symptom debut within 6 months after vaccination, giving an incidence of >10/100 000 the first year after vaccination, whereas the incidence in the unvaccinated cohort was about 0.7/100 000. The second year after vaccination the incidence in vaccinated children was 1/100 000, not statistically different from the incidence in the unvaccinated children.

Mean age was 10 ½ years, 35 girls and 23 boys. Other characteristics were EDS (58/58), abrupt and fulminant onset (58/58), cataplexy (46/48), tissue type HLA-DQB1*0602 (37/37), Low CSF hypocretin level (41/41), rapid weight gain (22/47), irritability or aggression (6), Depression (7). In the younger children the cataplectic attacks were often reported with components of facial dystonia, which in addition to the marked weight gain and psychological changes with aggression, is in accordance with recently described characteristics of narcolepsy in children.

Leisure-time physical activity predicts snoring in women: a prospective cohort study over 10 years

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Objective: To assess the impact of physical activity on snoring incidence and remission in women.

Methods: A population-based sample of 4,851 women aged > 20 years responded to questionnaires in year 2000 and 2010. Based on the responses, the women were categorised into low, medium or high level of leisure-time physical activity at baseline and at the follow-up. **Results:** The prevalence of self-reported habitual snoring increased from 7.6% at baseline to 9.2% in 2010 ($p < 0.0001$). After adjusting for age, BMI, waist and neck circumference, weight gain, smoking,

alcohol dependence and snoring status at baseline, physical activity level at baseline had a protective effect on habitual snoring at follow-up. The adjusted odds ratio (OR) (95% confidence interval) for habitual snoring was 0.7 (0.5 to 0.9) for the medium physical activity level and 0.5 (0.4 to 0.8) for the high activity level. When subdividing the population by changes in physical activity level over the follow-up period, an increase in physical activity was followed by a decrease in the risk of being a habitual snorer. Similarly, a high level of physical activity only had a protective effect on snoring in subjects who remained at a high or medium level.

Conclusions: A low level of physical activity is a risk factor for future habitual snoring in women, independent of weight, weight gain, alcohol dependence and smoking. Increased physical activity can modify the risk.

Reported Sleep Problems and Daily Functioning in Children with ADHD and in Controls

:: Abstract Theme: Psychiatric sleep disorders

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Background: ADHD (attention deficit/ hyperactive disorder) is a neurodevelopmental disorder with a prevalence of 2-5 %. Co-morbidity appears in up to 75% of children and 2/3 of parents report significant sleep related problems. Daily function of children with ADHD is impaired compared to normal controls. Functional impairment is measured on family, school, peer and social factors, but whether the degree of functional impairment and sleep related problems are correlated is not known. The aim of this study is to investigate how daily function and sleep are reported in children with ADHD compared to a matched control group and how the relation of impairment and sleep is correlated. **Method:** A case control study including all consecutive patients age 6-14 years from the school department of Child Psychiatric Department,

Risskov. Assessment: A rigorous diagnostic interview (Development and Well-Being Assessment) and validated questionnaires about sleep related problems (Children's Sleep Habits Questionnaire), daily functioning (Weiss Functional Impairment Rating Scale) and ADHD symptoms score (ADHD Rating Scale). Aim: See how sleep problems and daily functioning correlates in this patient group and look into the impact of subtypes and co-morbidity on sleep problems.

Sleep in children with ADHD before and after treatment with methylphenidate

:: Abstract Theme: Psychiatric sleep disorders

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Background: In addition to ADHD core symptoms, co-morbid conditions occur in up to 75 % of patients with ADHD. Parents to children with ADHD and the children themselves also frequently report sleep problems of significant importance. And the question arises: are sleep problems a co-morbidity or an etiologic cofactor or? Both objective and subjective studies have been performed, and the findings are ambiguous. Sleep problems are reported in clinical practice in 25-50% of children and adolescents with ADHD. Methylphenidate causes increasing activity of the central nervous system. Methylphenidate increases or maintains alertness, combating fatigue, and improves attention. The impact of methylphenidate on sleep is not well investigated. Design: A clinical trial: 1. Reported sleep problems in an ADHD cohort within 1 year vs. 100 normal controls. 2. Objective sleep investigation 3. Pre-post analysis of the impact of methylphenidate on reported sleep problems and sleep patterns measured with PSG. Methods and material: All referred medicine naïve children age 8-12 diagnosed with ADHD at BUC-Risskov within

a 12 months period. Purpose: To describe sleep problems and sleep patterns in a cohort of newly referred patients with ADHD. The study will also contribute to the knowledge of objectively measurable sleep patterns in children with ADHD and in the subtypes and be correlated to co-morbidity. Furthermore, the influence of medical treatment on sleep patterns will be evaluated.

Sleep apnea and diabetes - does CPAP modify diabetes outcomes?

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One in three patients with type 2 diabetes suffers from obstructive sleep apnea. Obstructive sleep apnoea (OSA) is associated with excessive daytime sleepiness, fatigue and different aspects of mental dysfunction. Sleep disordered breathing including OSA has major socioeconomic consequences for the society and affects quality of life for the individual patient. The reported prevalence of OSA in patients with type 2 diabetes (T2D) is unknown. In Denmark, we have in a recent study performed among T2D patients at Steno Diabetes Center observed an OSA prevalence of 34% in newly referred patients with T2D. In comparison, estimates of the prevalence of OSA in the general population have ranged from only 1-5 % in adult men and 1-2 % in adult women. In this perspective, we as diabetologists have been sleeping in our clinics and OSA might represent a newly discovered modifiable risk factor for the level of hyperglycemia and thereby the development and progression of T2D. CPAP response to components of insulin resistance appears heterogenic, with some studies showing an immediate beneficial treatment effect, persisting over 3 to 6 months and other showing no difference. Issues in the consistency of CPAP treatment benefit may be the severity of OSA, obesity and lipid abnormality, small heterogenous study populations and lack of rigor in controlled trials. Prospective randomized clinical trials are needed to test the hypothesis that effective treatment of OSA can improve glycemic control

and/or the underlying mechanism: insulin resistance and thereby complications of T2D.

Night work, anxiety and depression among Norwegian nurses: A latent growth curve modeling study

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Objectives: To investigate whether different work schedules among Norwegian nurses predict differences in developmental trajectories of anxiety and depression symptoms in a two year time period. **Methods:** Latent growth curve modeling was used to investigate initial values and rate of change in anxiety and depression symptoms over two years in a sample of nurses (N=726). The observed factors in the models were the anxiety and depression subscales of the Hospital Anxiety and Depression scale. Predictors in the models were night work, changing from day work to night work, and changing from night work to day work. In the models we controlled for age, gender, and the personality variables hardiness, morningness, flexibility and languidity. **Results:** There were no significant differences in initial values or rate of change in anxiety between each of the shift schedule predictors and the reference group (day work). Languidity predicted higher and hardiness predicted lower initial anxiety values. There were no significant differences in initial values of depression between each of the shift schedules and day work, but changing from night work to day work predicted a different rate of change compared to day work (i.e. a negative slope of depression compared to the reference group). No other shift schedule significantly predicted rate of change. Age and languidity predicted higher and hardiness predicted lower initial values of depression. **Conclusion:** There were no differences in initial values or rate of change of anxiety or depression symptoms between night workers and day workers. However, nurses changing from night work to day work had a

decrease in depression symptoms over time compared to day workers.

The Origin of REM Sleep: A Hypothesis

:: Abstract Theme: Basis of Sleep

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This article presents a new theory about the origin of REM sleep. REM is an integral part of the human sleep cycle and the neurological substrate most consistently associated with dreams and dream recall. According to this thesis, REM sleep evolved out of a primordial defensive reflex: tonic immobility. This reflex, sometimes also called death-feigning or animal hypnosis, is usually the last line of defense against an attacking predator. Tonic immobility, common in both vertebrates and invertebrates, has a number of neuroanatomical and behavioral attributes that overlap with those of REM sleep. This overlap is suggestive of an evolutionary kinship. The article presents conceptual arguments and empirical facts in support of this relationship. **Keywords:** REM sleep, tonic immobility, narcolepsy, amnesia, thermoregulation

The Prevalence of Insomnia in Norway - the Nord-Trøndelag Health Study

:: Abstract Theme: Burden of sleep disorders

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Background Many studies have assessed the prevalence of insomnia, but the influence of non-participants has largely been ignored. **Objective** To estimate the prevalence and associated factors of insomnia in a large, adult population. **Methods** This cross-sectional study used data from the third Nord-Trøndelag Health Study performed 2006-2008. Among 93,860 invited, 50,807 (54%) participated. 40,535 (43%)

responded to an insomnia questionnaire. The insomnia diagnosis was based on DSM-IV-TR criteria. Overall age-adjusted prevalence of insomnia was estimated using the age distribution of all adult inhabitants in the Norwegian county Nord-Trøndelag. Supplementary prevalence data were estimated by extrapolating data from a non-participant study. Of 43,053 non-participants invited, 6,918 (16%) responded to insomnia questions. In the multivariate analyses, the association between insomnia and self-reported health was estimated, adjusting for known confounders. **Results** The total age adjusted prevalence of insomnia was 7.4 % (8.6% in women, 5.5% in men), increasing to 8.9% when including data from non-participants. Insomnia was more than 8 times more likely (OR=8.5, 95% CI 6.5-11.3) among individuals with very poor health vs. very good health, adjusting for age, gender, chronic musculoskeletal complaints, anxiety and depression. **Conclusion** The insomnia prevalence increased from 7.4% to 8.9% when considering non-participants. Insomnia had a huge impact on general health.

Sleep and sleepiness on watch in two of the most common maritime watch systems: a simulator study

:: Abstract Theme: Basis of Sleep

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Fatigue at sea jeopardizes safety and contributes to accidents. We studied sleep and sleepiness on watch in a simulated 4h on/8h off (4/8) versus a 6h on/6h off (6/6) watch system as well as the effects of disturbance of 1 free watch, simulating a condition of overtime work. 50 experienced officers participated in a 4/8 (n=30) or a 6/6 (n=20) system on an identical simulated 1-week voyage through the North Sea. The free watch disturbance was counterbalanced taking place in the first or the second half of the week. Sleepiness (Karolinska Sleepiness Scale, KSS) was rated

hourly and a 5-minute psychomotor vigilance test (PVT) carried out at the start and end of every watch. EEG was recorded during six watches. In both systems, sleepiness increased with hours in watch ($p < .001$), being higher during night/morning watches than afternoon/evening watches ($p < .001$ in 4/8 and $p = .002$ in 6/6). The free watch disturbance increased sleepiness in both systems ($p < .001$). Overall sleepiness was highest in the 6/6-system ($4.6 \pm .2$ versus $3.9 \pm .2$, $p = .013$). Similar effects, except the difference between watch systems, were observed for PVT. Sleep on watch was more common among participants in 6/6 (47%) than in 4/8 (37%). Sleepiness and sleep on watch peak at the end of night/morning watches and do so even more after a single free watch disturbance. Overall, sleepiness and sleep on watch are more severe in the 6/6-system, indicating that this system poses a greater risk for fatigue related accidents.

Sleep, sleepiness and performance on the bridge and in the engine room during a simulated voyage under a 6h on/6h off maritime watch regime

:: Abstract Theme: Basis of Sleep

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Fatigue among watch keepers is a growing concern in the maritime sector. We investigated sleep, sleepiness and performance on watch in a simulated 6h on/6h off watch system on the bridge and in the engine room. 40 experienced officers participated in a bridge (n=20) or engine room (n=20) simulator on an identical simulated 1-week voyage through the North Sea. Sleepiness (Karolinska Sleepiness Scale, KSS) was rated hourly and a 5-minute psychomotor vigilance test (PVT) carried out at the start and end of every watch. Waking EEG was recorded during four watches and several naturalistic performance indicators were scored by simulator instructors.

Sleepiness increased with hours in watch ($p < .001$) and was higher during the 1st than during the 2nd watch of the day ($p = .013$ on the bridge; $p < 0.001$ in the engine room). On the bridge, but not in the engine room, sleepiness increased over the course of the week (from $3.1 \pm .3$ to $4.3 \pm .4$; $p = .008$). PVT reaction time was higher during the 1st than during the 2nd watch of the day, but only in the engine room ($p = .001$). Sleep on watch was as common among bridge (21%) as engine room (28%) participants. Several performance indicators were affected, but in different ways. Sleepiness peaked at the end of night and morning watches. On the bridge, it even increased with time in voyage. About a quarter of all participants slept on duty. This poses a potential safety risk for longer voyages adopting a 6h on/6h off-watch keeping regime.

Age-related sleep changes in sleep pattern and sleep structure and the association to cognitive performance; The Metropolit 1953 Danish Male Birth Cohort

:: Abstract Theme: Normal sleep and aging

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Abstract: Advancing age is accompanied by changes in sleep pattern and increased prevalence of both sleep disturbances and cognitive impairment. Previous longitudinal studies exploring age dependent sleep and cognitive changes are scarce. Since disrupted sleep is linked to cognitive dysfunction we hypothesised whether impaired sleep is an early sign of cognitive deterioration. **Participants and Methods:** Participants were healthy males recruited from the Project Metropolit 1953, . Based on earlier cognitive assessments, subjects entered the study as cognitively unimpaired ($N = 97$) or cognitively impaired ($N = 92$). Overnight polysomnographic recordings were collected from a total of 189 subjects. The

cognitive measures included Mini Mental State Examination, Addenbrookes test, Digit Substitution Symbol Test, Trail Making A and B-test, 15 world pairs, and Cambridge Neuropsychological Test Automated Battery (CANTAB) measured current cognitive abilities was applied. The main outcome measure was incident sleep polysomnographic characteristics **Study design:** Case-control design. **Results:** Cognitive impaired males showed lower sleep efficiency than cognitive unimpaired males ($78,54 \pm 12,82$ vs. $83,14 \pm 10,56$ $p = 0,02$) and increased nocturnal wakefulness ($17,23 \pm 6,97$ vs. $12,76 \pm 9,25$, $p = 0,02$) Percent stage REM sleep was slightly increased in cognitively impaired males compared with the cognitively unimpaired ($17,60 \pm 6,97$ vs. $15,69 \pm 6,27$, $p = 0.05$). However, none of these polygraphic measures showed significant group differences after Bonferroni correction. Furthermore we found no strong correlation between sleep measures and cognitive test scores. **Conclusion:** Subtle cognitive changes have, if any, relatively little influence on sleep per se. Future research is needed to study the heterogeneity of cognitive aging and potential predictors of cognitive decline.

Circadian rhythm disturbances in a rat model of depression

:: Abstract Theme: Psychiatric sleep disorders

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In major depressive disorder sleep disturbances are very frequently occurring, in particular in stress-induced depressions. Likely these disturbances are caused by persistent elevations in cortisol levels and disruptions of the diurnal cortisol rhythm. Using a rat depression model which is relying on the chronic exposure of rats to a sequence of unpredictable mild stressors, the chronic mild stress (CMS) model, we set out to study these circadian disturbances. Rats become anhedonic-like which is one of the major symptoms in depression, e.g. a reduced ability to experience pleasure, but do also have a number of minor depression symptoms including

disruption of sleep patterns. Rats increase in REM sleeping, mainly in the beginning of their inactive period. We observe severe alterations in the diurnal corticosterone rhythm and also report on the status of serum melatonin. Studies on the oscillations in clock-genes in, as well the periphery, as in CNS is ongoing.

Conclusion: The prevalence of SWD in this population was high. Possible predictors of developing SWD over time were identified.

Shift Work Disorder among Nurses – a follow up study

:: Abstract Theme: Burden of sleep disorders

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Objectives: Shift work is associated with sleep problems and poor health. Few longitudinal studies on shift work related problems exist. The aim of the study was to assess shift work disorder (SWD) after two years follow-up, and to find predictors of this diagnosis among Norwegian nurses. **Methods:** 1533 nurses participating in a survey on shift work, sleep and health responded to questionnaires including variables in terms of insomnia (Bergen Insomnia Scale), sleepiness (Epworth Sleepiness Scale), anxiety/depression (Hospital Anxiety and Depression Scale) and circadian preference (Diurnal Scale) at baseline and two years later at follow-up. **Results:** The prevalence of SWD was 35.7% at baseline compared to 28.6% at follow-up ($p < .001$). Adjusted logistic regression analyses showed a significant association of having SWD at follow-up and the following variables measured at baseline; number of nights worked the last 12 months (OR=1.01, 95% CI=1.01-1.02), having SWD (OR=5.19, 95% CI=3.74-7.20), sleepiness (OR=1.08, 95% CI=1.04-1.13), use of melatonin (OR=4.20, 95% CI=1.33-13.33), use of bright light therapy (OR=3.10, 95% CI 1.14-8.39), and symptoms of depression (OR=1.07, 95% CI=1.00-1.14). In addition, changing work hours from night work at baseline to not having night work at follow-up also showed a significant association (OR=0.12, 95% CI=0.07-0.22).